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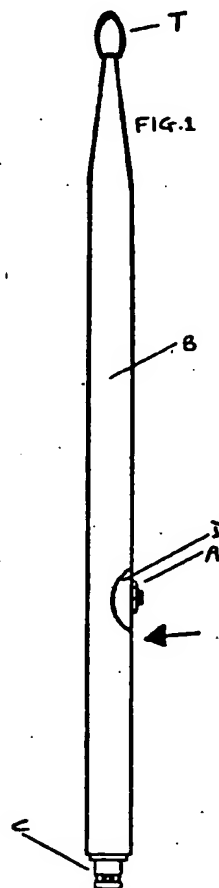
(58) Field of search

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(54) Drumstick electronic
controlling system

(57) A drumstick *B* incorporates an internal electromechanical transducer and optionally one or more switches *A* as a means of controlling external electronic circuitry. When the stick *B* strikes a drum or other surface, the transducer inside the stick converts the resulting vibrations into an electrical signal which may be transferred to a remote sound generating device (usually in the form of a control box) either by way of an electrical (e.g. plug-in) lead or a wireless transmitter. An on-off switch may be provided on the stick (as at *A*) or elsewhere in the electrical circuit.

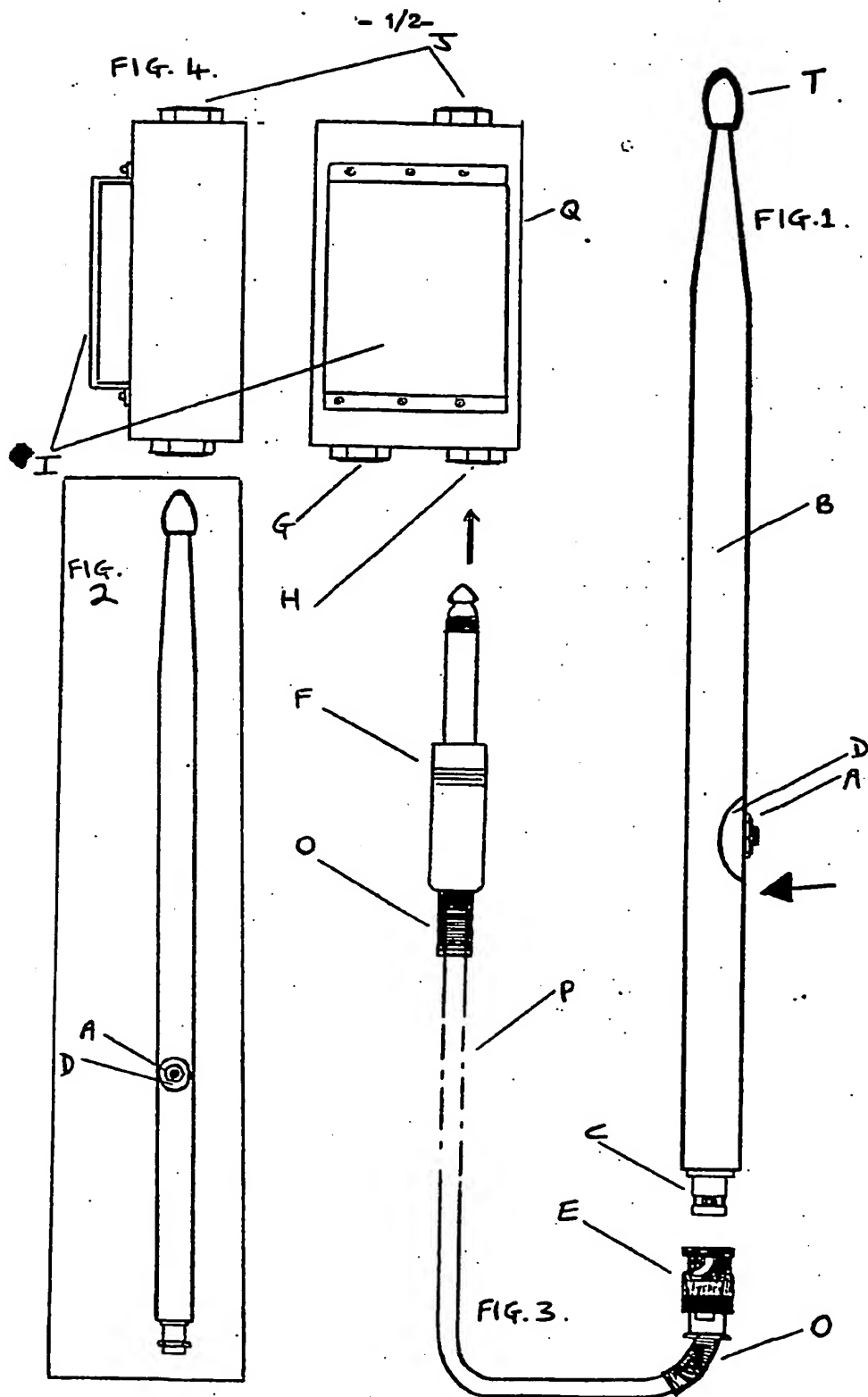


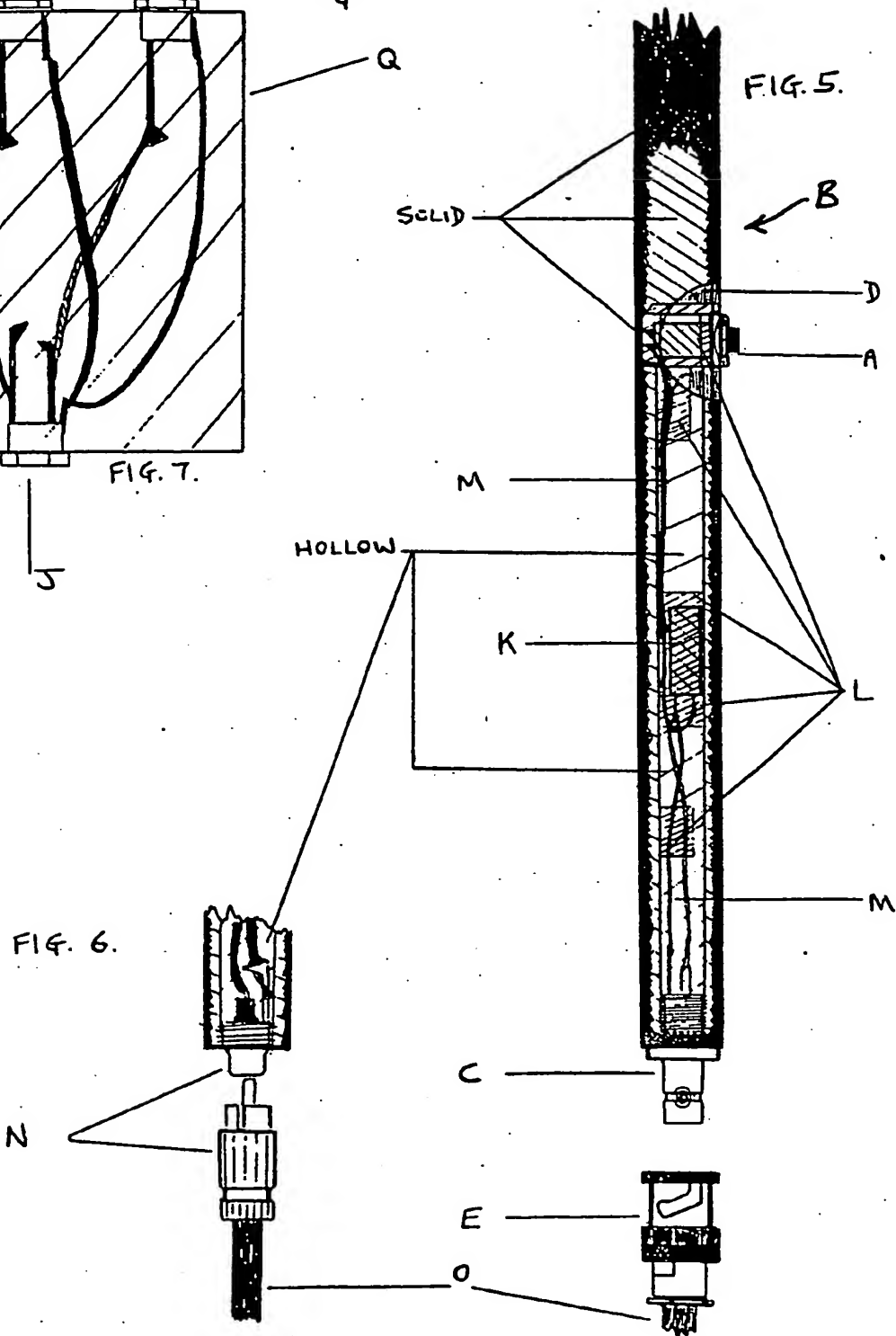
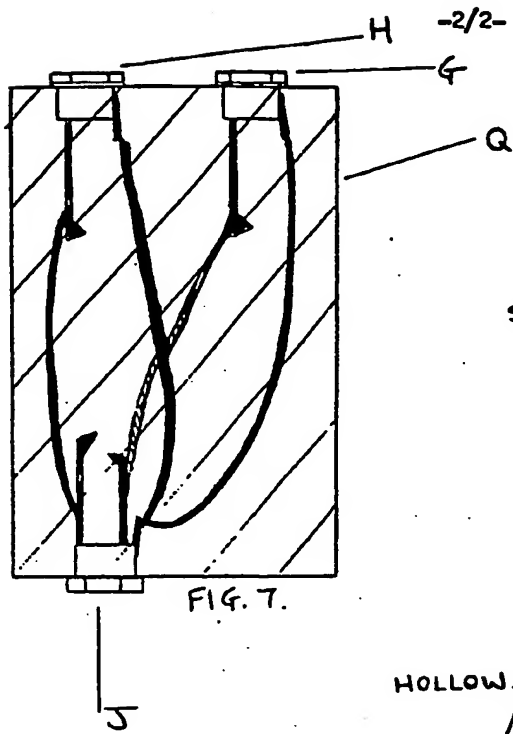
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SPECIFICATION

Drumstick electronic controlling system

- 5 This invention relates to a drumstick which is capable of being used to control electronic circuitry without the use of any special type of drum or surface.

- 10 Electronic drums are becoming increasingly popular in the music industry. They can usually produce interesting sounds which cannot be obtained with any kind of purely acoustic instruments. They are often capable of closely mimicking acoustic percussion instruments as well.

- 15 There are two popular ways of controlling these types of electronic drums, namely by beating sensitive drum pads manually or with sticks, or by electronically sequencing the sounds (i.e. a drum machine).

- 20 Any drum pads with a good sized playing surface are bound to be fairly bulky, they require stands and do tend to be relatively expensive. A drum machine is not strictly a "live" musical instrument, when it has been programmed it simply plays itself, this presents an "enemy" to many professional drummers and percussionists.

- 25 Despite the usefulness of electronic percussive sounds, it seems that the majority of drummers favour acoustic drums, although many of these people would welcome the facility of using electronic sounds as well.

- 30 This invention introduces the provision of a drum stick incorporating one or more transducers capable of converting vibration to electrical energy.

- 35 The transducer is in the form of an electromagnetic or other electromechanical transducer.

- 40 Advantageously one or more electrical switches are also incorporated into the drumstick.

- The resulting electrical signal is conveniently transferred from the stick to other electronic apparatus by means of a releasable cord, or by means of a wireless transmitter.

- A specific example of the invention will now be described together with examples of variations. Reference is made within the description to the accompanying drawings in which:-

- 50 *Figure 1* is a side view of the stick;

- Figure 2* is another view of the stick to a further reduced scale and in direction of the arrow in *Fig. 1*;

- 55 *Figure 3* shows the connecting cord and plugs, the actual cord has been abbreviated by means of the dotted lines *P*;

- Figure 4* shows the cord junction box in side and rear elevations;

- 60 *Figure 5* illustrates a cutaway view of the internal workings of the rear half of the stick, a BNC type connector is also shown;

- Figure 6* shows the employment of a phono type connector as an alternative to the BNC type; and

Figure 7 shows an internal view of the junction box;

- A practical embodiment of the drumstick of the invention as illustrated in *Figs. 1* to *5* is round in cross-section with a switch *A* protruding therefrom in its central region. The stick *B* conveniently takes the form of a conventional wooden or nylon tipped drumstick with the addition of the switch *A* and a BNC female connector *C* located at its rear end i.e. at the end remote from the tip *T*. The switch *A* is located about one third of the way along the stick *B* from the rear end and it is set into a metal or plastics cover *D* which provides a neat method of securing the switch *A*.

- 70 With a BNC male connector *E* (see *Fig. 3*) fitted to the female connector *C* on the stick *B* and a jack plug *F* connected to the male connector *B*, suitably connected to an electronic percussion sound generating device which is capable of being triggered by a tiny alternating current being introduced into its circuitry, the stick *B* may be used to beat drums, cymbals or other percussion instruments in a normal way. When the switch *A* is pressed, however, subsequent beats will trigger the electronic device and thus generate electronic sound. The effect can be obtained whilst playing a real drum or cymbal or, alternatively, an acoustically "dead" surface can be "played" e.g. a wall, a drum rim, a cymbal stand or even a human body, when only the electronic sound will be heard. Releasing switch *A* will cause the stick to revert to functioning as a normal drum stick for all practical purposes.

- The sound generating device, which is generally in the form of an electronic circuit built into a control box can be capable of producing a different sound effect dependent on how hard or soft is the mechanical impact upon the stick. This is because between an upper and lower limit, the voltage of the output of the stick will be proportional to the amount of vibration travelling through it.

- 100 Since most drummers have two arms, they tend to use two sticks rather than one. For this reason, a simple plug-in junction box *Q* has been devised, as illustrated in *Fig. 4*, which can be affixed to a waist belt by means of a channel *I* or a clip. The junction box *Q* has two sockets *G* and *H*, into which the jack plugs *F* from two sticks can be plugged and a stereo jack socket *J* whereby the two sticks *B* can be connected to the control box via one stereo cord (not shown). Provided that the circuitry within the control box is adequate to give two separate sounds from two separate triggers, each stick can operate independently and provide a different sound from the other. The internal wiring of the junction box *Q* is shown in *Fig. 7*. The casing of the junction box *Q* can be metal or plastics but if the control box is susceptible to atmospheric interference an earthed metal casing is sug-

gested and in this case all connecting leads should also be of the screened type.

The internal arrangement of the components of the drumstick *B* is shown in Fig. 5. A

- 5 piezoelectric transducer element *K* is wired in parallel with the female BNC socket *C* via the switch *A* by wires *M*. The switch *A* is of a normally open type and only completes the circuit when it is pressed. When the button of the switch *A* is held down and the stick *B* is played, i.e. struck on a surface, vibrations travel through the stick *B* and are picked up by the transducer *K* which sends a small electrical signal down the wiring to the socket *C*.
10 The transducer *K*, the switch *A* and the wires *M* are secured firmly in place by means of an epoxy resin or similar substance. Essential areas for locating the resin are indicated by reference letter *L*. The remaining hollow sections may be filled with a packing material, such as paper, but the use of further resin will add strength and rigidity to the stick *B*. In any event, care should be taken to ensure the balance of the stick complies with the user's requirements.

- The use of a switch *A* is not an essential feature of the invention. On the one hand, a suitably small switch may prove to be unreliable when subjected to high stresses, whilst on the other hand an overly large one would require a hole or cutout which could seriously weaken the stick. The use of a material of high tensile strength, e.g. carbon fibre, for making the body of the stick could overcome any problems of weakness or possible breakage. Good results have so far been achieved using hickory sticks and aluminium or metal alloys might prove to be particularly suitable.

- The lead from the junction box *Q* to the stick *B* should be at least 1.5m in length with a coiled section of about 30cm immediately adjacent the junction box, to allow freedom of movement without wires or cords getting in the way. To further assist with keeping the wires or cords out of the way they can be attached to each of the user's arms with one or two small bracelets made from fabric, and using some form of quick release fastening e.g. Velcro (Registered Trade Mark).

- 50 The plugs specified are only examples. If it is decided to use active transducers in the stick *B* whereby power is fed to the transducer *K* by means of additional connections, or if a more advanced switching control system is used in the stick *B*, multi-pin connectors will have to be used e.g. DIN plugs or locking types. The BNC plug in the example is good because it has very positive screening, silver plated low loss contacts and a bayonet type locking collar which effectively prevents accidental disconnection yet allows very quick connection or disconnection when required.

- In Fig. 6, the use of phono connectors *N* is shown as an alternative. These connectors *N* are somewhat smaller than the BNC type yet

they are possibly more robust. They are cheaper, but do not have any latching facility. The jack plug connectors on the junction box *Q* could also be replaced with phono plugs or other types of connectors. A more compact version can be made if required. All the plugs should have cord grips and flexible cord protectors fitted. The plugs should not short-out any two contacts when being plugged in or out.

- 75 The control box (not shown) must be sensitive to the small output of the transducer *K* within the stick *B* but it should not be oversensitive. Oversensitive circuitry is liable to be triggered when switch *A* in the exemplified embodiment is pressed. This is a variation of the invention but not intended to happen during use of the particular example. A variable resistor should be used to adjust the input sensitivity of the circuitry. This can introduce creative control as well as preventing accidental triggering.

- A suitable control box must incorporate one or more appropriate electronic circuits to provide an audio output for amplification. With the exception of the power source and the output mixer, all the circuitry is preferably duplicated to provide a full set of separate controls for each of two sticks. On each channel there should be a VCO and a noise generator with an attack and decay envelope shaper for each, a level control for each and a click generator with level control, a filter with cut-off frequency control and high-pass/low-pass switching, a sweep control for both the VCO and the filter giving control over sweep rate and amount, as well as direction. A low frequency oscillator should be provided with a rate control and modulation control over the VCO and filter, the filter should have a resonance control, and the VCO should have a pitch control as should the noise generator. A sensitivity control and output level control should also be provided. If possible the facility to programme and store sounds in a memory for instant access should be included. Programmable drum rolls and digital sampling would also be useful features. A MIDI would assist expansion.

- 115 The control box casing should be both robust and attractive, it should be capable of being mounted on a stand for easy access.

- If a stick in accordance with the invention is constructed without the switch, a switch may be provided in the form of a foot pedal for convenience. A further development of the invention is the possible inclusion of a MIDI remote control system within the drum stick. This is the equivalent of the inclusion of a switching system within a drumstick.

- The essence of the drumstick electronic controlling system is that such drumsticks as have been outlined could be used to control almost any type of electronic equipment and not just for generating sound. A drumstick

could, for example, provide control over a stage lighting set-up.

A further variation within the scope of the invention is to use a switching system that does not rely on impact or the use of a finger operated switch. For example, by using a mercury tilt switch or other gravity switch within a drumstick it is possible to seem to be playing an invisible drum. This approach is not likely to appeal to serious musicians as the actual point of trigger can be unpredictable. It is more suited to use as a toy.

Another useful method of incorporating switches would be to use magnetic reed switches within the stick. These could be operated by the use of a magnetised finger ring.

The transducer can be incorporated at any point on or in the stick including the playing tip.

As an alternative to using an electrical cord to convey the electrical signal from the transducer within the drumstick to the sound generating circuitry, a wireless transmitter (e.g. radio transmitter) may be incorporated into the stick, together with a battery. This approach will provide a self-contained unit which is not restricted by wires. A receiver circuit will be needed in order to collect the transmitted signal and re-convert it to an electrical pulse which can trigger the sound generating circuitry.

The transmitter may take the form of a conventional thick-film or I.C. radio circuit embedded in epoxy resin to prevent movement or damage when the stick is subjected to blows. The drumstick will provide opportunity to incorporate an antenna of good length and therefore high efficiency. To aid access to and replacement of the battery, a locking or screw fitting cap may advantageously be provided at the rear of the stick. Alternatively, a nickel-cadmium or other type of rechargeable battery can be incorporated, which battery may be recharged via a socket such as the phono-type socket mentioned above.

The receiver which connects to the sound producing circuitry may or may not be an integral part of the control box. In any event it should be capable of differentiating between signals originating from the transducer in the drumstick and signals from switches within the drumstick. One or more switches could then be used to change sounds when using suitable (programmeable) sound producing circuitry.

The international MIDI (musical instrument digital interface) standard will allow connection to a vast range of compatible equipment, e.g. synthesiser drum units, drum machines, electronic keyboards, synthesiser modules, note/chord sequencers, music computers and other electronic musical instruments.

CLAIMS

1. A drumstick incorporating one or more

transducers capable of converting vibration to electrical energy.

2. A drumstick as claimed in claim 1 and further incorporating one or more electrical switches.

3. A drumstick as claimed in claim 1 or 2, to which an electrical cord is attached.

4. A drumstick as claimed in claim 1 or 2, to which an electrical cord is releasably attached by means of a locking connector.

5. A drumstick as claimed in claim 1 or 2 and further incorporating a wireless transmitter.

6. A drumstick substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

CLAIMS

New claims or amendments to claim filed on Superseded claims 1-6.

New or amended claims:- 1-7.

1. A drumstick or beater incorporating one or more transducers to convert into electrical energy the shock waves which result from percussion.

2. A drumstick as claimed in claim one and further incorporating one or more electrical switches.

3. A drumstick as claimed in claim one or two to which an electrical cord is attached.

4. A drumstick as claimed in claim one or two to which an electrical cord is releasably attached by means of a locking connector.

5. A drumstick as claimed in claim one or two and further incorporating a wireless transmitter.

6. A drumstick as claimed in claim 5 and further incorporating a rechargeable battery which can be charged by means of an electrical connector fitted to the stick.

7. A drumstick or beater substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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